

REMARKS

Claims 1-5 and 8-15 are pending after entry of this paper. Claims 1-5 and 8-13 have been rejected. Claims 6-7 remain cancelled without prejudice. Claims 14 and 15 have been newly added. Support for the newly added claims can be found in claims 6 and 7 as originally filed.

Claims 1 and 13 have been amended. Support for the amendments may be found throughout the instant specification and the claims as originally filed.

No new matter has been introduced by these amendments. Reconsideration and withdrawal of the pending rejections in view of the above claim amendments and below remarks are respectfully requested.

Response to Rejections under 35 U.S.C. §103

The Examiner has rejected claims 1-5 and claim 13 over U.S. Patent No. 3,951,649 (“the ‘649 patent”) in view of U.S. Patent No. 6,165,367 (“the ‘367 patent”) and in further view of U.S. Patent No. Re. 38,118 (“the ‘118 patent”). Applicant respectfully disagrees with the Examiner’s contention that the combination of the cited references renders the claimed invention obvious.

The Examiner applies the ‘649 patent in view of the ‘367 patent to claim 1 for the reasons set forth in the July 10, 2007 Office Action. The Examiner applies the ‘118 patent for teachings relating to the quantities of alkali chloride and monovalent copper in the solution, a feature no longer recited in claim 1 as amended. Thus, applicant herein addresses the rejection to claim 1 as set forth in the July 10, 2007 Office Action, and the Examiner’s response to

arguments set forth in the December 13, 2007 Office Action. The contentions raised in the telephonic interview regarding the '118 patent are addressed at the end of this discussion.

In the detailed rejection, the Examiner quotes various portions of the references without specifically linking these statements or teachings to the claimed elements, leaving applicant to assume the reasons for citing particular passages of the references. Applicant addresses each citation below.

The Examiner first cites the abstract and Figure 1 of the '649 patent, apparently to demonstrate that the '649 patent is in an art analogous to the instant application. Applicant agrees insofar as both the '649 patent and the instant application relate to processes useful in the hydrometallurgical production of copper from copper-containing raw materials. However, while the '649 patent describes the entire multi-stage process, the instant claims and application relate to one specific process step, namely the purification of a copper chloride solution.

The Examiner further cites column 2, lines 55-64 of the '649 patent, which contain a brief description of the leaching step of the process (item **12** of Figure 1). In the first instance, the leaching of copper from a copper-containing ore or raw material by means of an aqueous ferric chloride solution (*See* col. 2, line 55-58) is a process step that relates to the generation of a copper chloride solution, not to the purification of a copper chloride solution. Applicant therefore believes that the Examiner has cited this portion to show that this step “will maximize the formation of cuprous chloride [*i.e.*, monovalent copper] rather than cupric chloride [*i.e.*, divalent copper]” (col. 2, lines 62-63). As the Examiner suggests, the leaching step of the '649 patent yields a solution where the copper is predominantly monovalent copper.

The Examiner also cites column 4, lines 33-47, and specifically quotes lines 33-34, which state that “[a]fter HCl has been removed from the leach solution, the leach solution is

treated to remove ferrous chloride.” The Examiner parenthetically states “impurity-noted by examiner” (page 3 of the July 10, 2007 Office Action), implying that the Examiner believes that this step meets the claim element “removing metal impurities.”¹ Further, the Examiner notes that “[o]rganic exchange reactant, like kerosene is used in ‘649 as leach slurry, but ‘649 does not explicitly teach ‘chelating ion-exchange resin”’ (*Ibid.*). Here the Examiner seems to imply that the so-called “organic exchange reactant” is being used in the ferrous chloride removal step. This implication is incorrect, for the reasons set forth below.

Firstly, the ferrous chloride removal as disclosed by the ‘649 patent is accomplished by crystallization (col. 4, lines 35-40 and item **34** of Figure 1), not by ion-exchange as the Examiner suggests. Thus, assuming *arguendo* that the ferrous chloride meets the claim element “metal impurities,” the removal of ferrous chloride as taught by the ‘649 patent does not constitute “removing metal impurities...using ion-exchange.”

Secondly, the ferrous chloride is removed from a solution from which the copper has already been removed. The removal of ferrous chloride from the leach solution in the ‘649 patent is a process step that occurs after HCl has been removed (col. 4, lines 33-34). The ‘649 patent is clear that the HCl removal process step (item **30** of Figure 1) occurs after copper removal:

After copper has been extracted from the leach solution in the solvent extraction zone **20**, the leach solution raffinate is passed to a distillation zone **30**, where the HCl therein (generated in the solvent extraction step) is removed by distillation and passed to a water absorption column **32**. (col. 4, lines 26-31).

¹ Applicant notes that the Examiner is impermissibly parsing the claim elements along arbitrary lines. The claim element which must be considered is at least “removing the metal impurities from [a monovalent copper] solution,” and more completely, “removing the metal impurities from [a monovalent copper] solution using...chelating ion-exchange resins.”

Furthermore, the ‘649 patent discloses kerosene in a process step that is completely separate and distinct from the ferrous chloride removal step.² Applicant considers this step of the process separately below.

“Kerosene” as a solvent is taught in the working example of the ‘649 patent (col. 5, line 32 – col. 6, line 55). The ‘649 patent specifically describes “a kerosene solution of a commercially available liquid ion exchange agent” (col. 5, lines 51-52) with which the filtrate leach solution is contacted. The ‘649 patent teaches that the filtrate leach solution “contain[s] dissolved copper chloride, ferrous chloride, and other metal chloride values” (col. 3, line 51-52). The ‘649 patent further state that:

This solvent extraction removes about 97 percent of the copper from the leach solution. The copper-loaded kerosene phase is subjected to copper stripping by aqueous sulfuric acid in a two-stage contactor; in this manner, essentially all the copper is removed from the organic phase and passed into the aqueous sulfuric acid phase. (col. 6, lines 3-9, emphasis added.)

The above passage describes two distinct stages of the overall process, exemplified as items **20** and **22** in Figure 1, respectively, and described in more detail at column 3, lines 50-60. Neither of the two stages involve the removal of ferrous chloride, which the Examiner implies is the impurity-metal in the process of the ‘649 patent. Instead, the ‘649 patent is clear that the solvent extraction step (item **20**) is a process step which involves removing the copper from the leach solution using a liquid ion exchange agent, leaving behind ferrous chloride and other metal chlorides in the solution. The ‘649 patent is also clear that the stripping step (item **22**) is a process step which involves removing copper from the organic phase (i.e., from the liquid ion

² The Examiner mentions “kerosene” as allegedly being an “organic exchange reactant.” Applicant notes that the ‘649 patent is clear that kerosene is not an organic exchange reactant; kerosene is merely a solvent (*See* col. 5, lines 48-56).

exchange agent) using sulfuric acid, leaving behind liquid ion exchange agent in the organic solution. **Neither step accomplishes “removing the metal impurities from [a monovalent copper] solution using...chelating ion-exchange resins” as recited in claim 1.**

The applicant presented an argument similar to the one set forth above in the October 10, 2007 Amendment and Response. In response to the argument, the Examiner stated the following:

In response, the argument is not persuasive because ‘649 teaches the similar metal ion separation process (removing ferrous chloride from a strong chloride solution of maximum [*sic*] the formation of cuprous chloride [citation removed]) as claimed in the instant claim and the copper ions are still in the chloride solution at that process step. (page 5 of the December 13, 2007 Office Action)

The Examiner’s response is completely inaccurate because, as described *supra*, the ferrous chloride is removed from a solution which has already been subject to a copper removal step.

For the above reasons, applicant respectfully submits that the ‘649 patent is deficient in multiple respects, not merely in the absence of a teaching of a “chelating ion-exchange resin,” as the Examiner implies on page 3 of the July 10, 2007 Office Action. The ‘649 patent discloses copper removal from a solution containing ferrous chloride and other metals, and discloses ferrous chloride removal from a solution with copper previously removed, but does not teach removal of metal impurities from a strong chloride solution of monovalent copper. The ‘367 patent does not remedy this deficiency.

The Examiner cites the ‘367 patent to address the deficiency of the ‘649 patent regarding the “chelating ion-exchange resin.” The Examiner contends that the ‘367 patent relates to a method of removing heavy metals from an aqueous waste stream using ion-exchange resins that meets the claim element “chelating ion-exchange resin.” The Examiner goes on to

conclude that “[s]imilar hydrometallurgical process to extract heavy [metal] impurities with similar ion exchange resin renders [claim 1] prima facie obvious” and that it would have been obvious “to choose [a] suitable ion-exchange resin as demonstrated in ‘367 in the process of ‘649.” Applicants respectfully disagree with this line of reasoning.

As the Examiner is well aware, 35 U.S.C. §103(a) states that a patent may be obtained unless the “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” The Examiner has failed to demonstrate that the subject matter as a whole would have been obvious, because the Examiner has not treated the claim elements in their entirety. One of the relevant inquiries is thus whether or not the claim element “removing the metal impurities from [a monovalent copper] solution using ...chelating ion-exchange resins” would have been obvious.

The ‘367 patent discloses ion exchange resins similar to those disclosed in the instant application. Furthermore, the ‘367 patent discloses that such ion exchange resins are useful in removing “heavy metals” from an aqueous solution. These teachings, however, fail to remedy the deficiency of the ‘649 patent, namely the removal of metal impurities from a strong chloride solution of monovalent copper. The Examiner contends that it would have been obvious to use the chelating ion-exchange resin of the ‘367 patent in the process of the ‘649 patent to arrive at instant claim 1. Applicant demonstrates the flaws in these combinations below.

Applicant first addresses the use of a chelating ion-exchange resin in the process step of ferrous chloride removal. As described in detail *supra*, the ‘649 patent describes that

ferrous chloride is removed from a solution which has been already subject to copper removal. As such, accomplishing the ferrous chloride removal by the chelating ion-exchange resin of the '367 patent would not result in a step of "removing the metal impurities from [a monovalent copper] solution using...chelating ion-exchange resins" because the copper has already been removed from the solution in a previous process step. Furthermore, there is neither an express teaching nor an implicit suggestion that the chelating ion-exchange resins of the '367 patent would be capable of performing the step of ferrous chloride removal as discloses in the '649 patent. For these reasons, this combination fails to render instant claim 1 obvious.

Applicant next addresses the use of a chelating ion-exchange resin in the process steps **20** and **22**, that is the solvent extraction and stripping steps. The solvent extraction step **20** of the '649 patent accomplishes the removal of copper from a solution by means of a liquid ion exchange agent. Thus, substitution of the chelating ion-exchange resin of the '367 patent for the kerosene solution of liquid ion-exchange agent in step **20** of the '649 patent would result in a step in which copper is removed from a solution by a chelating ion-exchange resin. This is in complete contrast to instant claim 1, which requires "removing the metal impurities from [a monovalent copper] solution using...chelating ion-exchange resins." Thus, this combination also fails to render instant claim 1 obvious.

As an additional matter, the use of an ion-exchange agent in the '649 patent teaches away from the invention as recited in instant claim 1, because it suggests that copper will bind to an ion-exchange resin. In contrast, the applicant has discovered instead a process by which impurity metals can be removed from a copper-containing solution because, as noted in the instant specification, "the resin does not bind monovalent copper so strongly, [thus] it remains in the chloride solution and passes through the resin" (page 4, lines 13-15 of the instant

specification, emphasis added). This would not be expected based on the teaching of the ‘649 patent. Further, the ‘367 is silent as to the interaction of copper and the ion-exchange resin.

In response to applicant’s arguments regarding the ‘367 patent set forth in the October 10, 2007 Amendment and Response, the Examiner stated the following:

The capability for using [a chelating ion-exchange resin] in [a] strong chloride solution³ and incapable [*sic*] of capture [*sic*] certain types of metal ions are specific properties for this type [of] resin. Therefore, specific properties would be inherently present when this type [of] resin [is] applied in the separation process. (pages 5-6 of the December 13, 2007 Office Action)

Whether or not the specific properties of removing impurity metals from a strong chloride solution of monovalent copper are inherent to a chelating ion-exchange resin is not germane to the patentability of instant claim 1. Claim 1 does not claim a chelating ion-exchange resin. Instead, claim 1 is a method claim, which claims a novel and non-obvious method of using a chelating ion-exchange resin. As discussed in great detail above, the combination of the ‘649 patent and the ‘367 patent does not render obvious the method as recited in claim 1.

In the telephonic interview of April 22, 2008, the Examiner responded to the argument as articulated above by referring to portions of the ‘118 patent. The Examiner specifically pointed to column 3 and Example 4 of the ‘118 patent, and contended that these sections disclose removal of metal impurities from copper-containing solutions, a disclosure that is relevant to the patentability of the pending claims. Applicant respectfully disagrees. Applicant asserts that the ‘118 patent does not teach removal of metal impurities from a strong

³ Applicant notes that the Examiner refers to the solution as being “a strong chloride” or a “strong chloride solution.” Applicant assumes that this is a clerical error, and that the Examiner means a “strong chloride solution of monovalent copper” as recited in claim 1.

chloride solution of monovalent copper, and thus the '118 patent does not remedy the deficiencies of the '649 patent and the '367 patent outlined above.

The '118 patent is directed to "the recovery of metal from an organic complex thereof" (abstract). Specifically, the '118 patent discloses the stripping of metals from metal complexes in an organic solution by treating the organic solution with a weakly acidic aqueous strip solution with a high chloride concentration (see col. 1, lines 54-60). The Examiner has directed the applicant's attention to column 3 of the '118 patent, where it is stated:

Compounds of Formula I are valuable for the selective extraction of antimony and/or bismuth contaminants from the highly acidic tankhouse electrolyte solutions used in copper refining. Typical solutions might contain from 35 to 60 g/l copper, from 0.01 to 0.6 g/l antimony and from 0.01 to 0.5 g/l bismuth and have sulphuric acid strengths of from 145 to 210 g/l (col. 3, lines 31-37)

The Examiner seemed to suggest that this disclosure meets the claim element of removing metal impurities from a strong chloride solution of monovalent copper. Applicant strongly disagrees. Although the '118 patent does not explicitly state whether the copper in the solution is monovalent or divalent, nevertheless it is implicit that the copper must be divalent because when copper is in an aqueous solution with a sulphuric acid strength of 145 to 210 g/l, the copper necessarily exists as copper sulfate (CuSO_4), i.e., divalent copper.

The Examiner has also directed the applicant's attention to Example 4 of the '118 patent, which recites, in relevant part:

Aqueous solutions containing 1 g/l of Fe^{3+} , Zn^{2+} , Ni^{2+} , or Cu^{2+} and having a pH value of 2.0 were made. The metals were taken as their sulphates. Metal-loaded organic solutions containing Fe^{3+} , Zn^{2+} , Ni^{2+} , or Cu^{2+} were separately prepared by rapidly stirring a 0.25 molar solution of extractant mono-2-(1,3,3-trimethylbutyl)-5,7,7-trimethyl octyl

phosphate with an equal volume of one of the aqueous solutions mentioned above for one hour at 25° C. The aqueous and organic phases were separated and the organic solutions were each analysed for metals content (col. 7, lines 7-16).

The Examiner has suggested that this disclosure also meets the claim element of removing metal impurities from a strong chloride solution of monovalent copper. Applicants again strongly disagree. The above passage describes that four separate aqueous solutions are prepared, each containing only one of the four metals. These four aqueous solutions containing only one metal each are then contacted with an organic solution containing an extractant for the purpose of preparing four organic solutions each loaded with only one metal. Thus, the process in the first portion of Example 4 does not disclose removing metal impurities from a strong chloride solution of monovalent copper. Indeed, at best it describes removing metals from a solution containing only that metal. Furthermore, the copper is clearly indicated to be divalent copper, as opposed to the monovalent copper of the instant claims. The remainder of Example 4, including the tabulated results, refers only to the extent of stripping of each of the four metal-containing organic solutions by the stripping method of the '118 patent.

For the foregoing reason, applicant asserts that the '118 patent contains no teaching or suggestion that would remedy the deficiencies of the '649 patent in combination with the '367 patent. Thus, the combination of the '649 patent, the '367 patent, and the '118 patent would not lead one of ordinary skill in the art to arrive at the invention as instantly claimed.

For the foregoing reasons, applicant believes that instant claim 1 is in condition for allowance. Applicant has not addressed dependent claims 2-5 and 8-15, which all depend directly from independent claim 1, nor has applicant addressed any of the remaining references

cited by the Examiner in combination with the '649, '367, and '118 patents to formulate a rejection of the dependent claims. Applicant believes that claims 2-5 and 8-15 are allowable for at least the reasons presented above with reference to independent claim 1. Applicant, however, reserves the right to address the rejections to the dependent claims and present independent bases for their allowability should such be necessary or appropriate.

CONCLUSION

Based on the foregoing amendments and remarks, applicant respectfully requests entry of this amendment, reconsideration and withdrawal of the rejection of claims, and allowance of this application. Favorable action by the Examiner is earnestly solicited.

AUTHORIZATION

The Commissioner is hereby authorized to charge any additional fees which may be required for consideration of this Amendment to Deposit Account No. **13-4500**, Order No. 4819-4721.

In the event that an extension of time is required, or which may be required in addition to that requested in a petition for an extension of time, the Commissioner is requested to grant a petition for that extension of time which is required to make this response timely and is hereby authorized to charge any fee for such an extension of time or credit any overpayment for an extension of time to Deposit Account No. **13-4500**, Order No. 4819-4721 .

Respectfully submitted,
MORGAN & FINNEGAN, L.L.P.

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By: /Andrew D. Cohen/
Andrew D. Cohen
Registration No. 61,508

Correspondence Address:

MORGAN & FINNEGAN, L.L.P.
3 World Financial Center
New York, NY 10281-2101
(212) 415-8700 Telephone
(212) 415-8701 Facsimile